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THE
ROMAN AQUEDUCTS
AND
FOUNTAINS

BY
S. RUSSELL FORBES.

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ROMAN AQUEDUCTS

AND

FOUNTAINS.

BY

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“Rambles in Rome.”

“The Footsteps of St Paul in Rome.”

“The Roman Catacombs.”

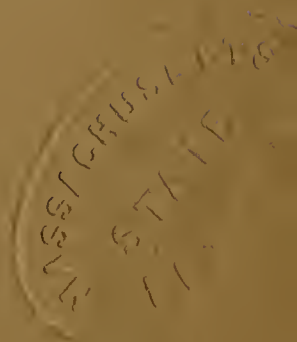
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ROMAN AQUEDUCTS

AND

FOUNTAINS.

One of the most interesting studies in Rome and on the Campagna is the Aqueducts, in fact without a good understanding of the Aqueducts many remains of ancient architecture would be inexplicable; the various long rows of arches that one sees on the Campagna are only a small portion of the system which made Rome the best water supplied city in the world.

On this topic many; or perhaps more erroneous ideas prevail, than is usual about Roman subjects; two common impressions being, that the Romans did not know that water found its own level; and that the aqueducts were all on arches.

Dionysius, 3. 68, says "The three most magnificent works in Rome, by which the greatness of the Roman empire chiefly appears are the Aqueducts, the paved roads and the drains."

Pliny, 36. 24, says "If we only take into consideration the abundant supply of water to the public, for baths, ponds, canals, household purposes, gardens, places in the suburbs, and villas; and then reflect upon the distances that are traversed, the arches that have been constructed, the mountains that have been pierced, the valleys that have been filled up, we must of necessity admit that there is

nothing to be found more worthy of our admiration throughout the whole universe.”

The method of conveying water in small pipes was fully understood by the Romans, this is not only attested by the numerous pipes found, but is fully described in the following passage from Pliny, 31. 31

“The most convenient method of making a water course from the spring is by employing earthen pipes, two fingers in thickness, inserted in one another at the points of junction — the one that has the higher inclination fitting into the lower one — and coated with quick-lime saturated in oil. The inclination, to ensure the free flow of the water is conveyed through a subterraneous passage, there should be air-holes let in at intervals of every two actus. Where the water is wanted to ascend aloft, it should be conveyed in pipes of lead: water, it should be remembered, always rises to the level of its source. If again, it is conveyed from a considerable distance it should be made to rise and fall every now and then, so as not to lose its motive power. The proper length for each leaden pipe is ten feet; and if the pipe is five fingers in circumference its weight should be sixty pounds; if eight feet, one hundred; if ten, one hundred and twenty; and so on in the same proportion.

A pipe is called “a ten-finger” pipe when the sheet of metal is ten fingers in breadth before it is rolled up; a sheet one half that breadth giving a pipe “of five fingers.” In all sudden changes of inclination in elevated localities, pipes of five fingers should be employed, in order to break the impetuosity of the fall: reservoirs, too, for branches should be made as circumstance may demand.”

We note in the above passage the distinct statement, “*it should be remembered water rises to the level of its source.*” This does away with one error.

Vetruvius, 8. 6, describes the instrument used for taking the levels. He says "I shall now describe how water is to be conveyed to houses and cities, for which purpose levelling is necessary. This is to be formed either with the dioptra and level (*libra equaria*,) or the *chorobaeus*. The latter instrument is however the best, in as much as with the dioptra, the levels are often found to be incorrect."

In the following chapter the same architect and author gives a long and thorough account of pipes and conducting of water.

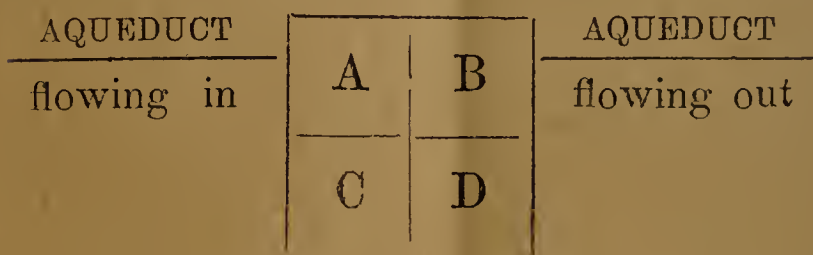
It should be borne in mind that the aqueducts were built not only to supply the city of Rome with water, but for the irrigation of the Campagna; and it was this want of irrigation which caused the desolation of the country round Rome.

Pure sources of water were selected, generally from the hills, many miles distant from, and at a considerable height above the city; virgin springs uncontaminated by surface or agriculture drainage were turned boldly into a stone or brick channel or *specus*. These channels vary in height from 4 to 6 feet, according to the volume of water to be conducted; and as they had no iron pipes, and their lead and terracotta pipes would not bear the great pressure it was necessary to make a channel of masonry, which was lined with a very hard cement called *opus signinum*.

In order to cross a valley they built arches, sometimes two rows high, and so carried the water across on the level, for if they had taken the *specus* down one side and up the other, there would have been such a pressure at the bottom of the valley that the channels would have been constantly bursting; and consequently there would be a continual expense for repairs; and so, as Pliny says, they levelled the valley. If they came to a mountain, hill or high ground they tunnelled, sometimes it was

necessary to face these tunnels with stone or brick often they made them through solid rock which required no facing. About every mile there was a bend in the aqueduct to break the force of the water; whilst there were numerous respirators, *lumina*, every 240 ft to admit air, for the flow of the water, and to relieve the pressure should the *specus* become too full. In the course of the aqueduct there were frequent *piscinae* and *castella* or reservoirs and filtering places; remains of these are scattered all over the hills and *campagna* and have been called all sorts of dignified names by those who did not understand them. For instance, an extensive one at Tusculum, built by Hadrian is called the Villa of Cicero. These *piscinae* alone would show that the Romans knew that water found its own level. They vary in size and in the number of the chambers, sometimes only four sometimes as many as twelve; several of these reservoirs are to be seen within the walls of the city of Rome.

A filtering place of four chambers will illustrate the principle.



The water entered chamber A and passed by means of holes in the floor into chamber C, from there through openings in the wall into chamber D, thence it rose through openings in the floor into chamber B and hence issued along the *specus* to Rome.

From the reservoirs in the city the water was distributed to every house by means of leaden pipes.

Horace says Ep I. X. 20 α Is the water, which strives to burst the lead in the streets, purer

than that which trembles in murmurs down its natural channel." Numerous lead pipes, inscribed with the names of the water and consuls have been found. At various times some of these channels in order to cross the low ground between the base of the Alban hills, and the high ground in Rome itself were carried on a series of arches, commencing about seven miles from the city; two rows of arches parallel to each other, and about fifty feet apart carried seven streams of water and formed an ornamental approach to the capital of the world; and are to the present day the admiration of visitors and the glory of the campagna.

" For 441 years after the foundation of the city the Romans were content to use water drawn from the Tiber, from wells or from springs. From springs whose memory is still sacred and honoured, for they are believed to give health to the sick. Such as the Camænæ, Apollo and Juturna springs." Frontinus.

There now flow into the city the Aqua Appia, Anio Vetus, Marcia, Tepula, Julia, Virgo, Alsietina, the same which is called Augusta, Claudia and Anio Novus." Frontinus, l. 4, . That is to say that between B. C. 312 and A.D. 100 nine aqueducts brought water into Rome.

At first they were under the care of the Censors and Ædiles, but the emperors instituted a special staff called *Curatores Aquarum* who had under them 720 men *aquarii*, to attend and keep the aqueducts in repair; 260 were appointed under Augustus, and Claudius added 460. Frontinus. " Augustus made the new office of surveyor of the aqueducts " Suetonius Aug, 37.

We propose taking the different aqueducts in the order of their creation; to call the attention of our readers to the various passages where they are spoken of in the classic writers; and to supplement these passages with notes on the remains and sources: Several ancient

writers refer to the aqueducts, but the great authority, who wrote a special treatise on the subject, is Sextus Julius Frontinus who was surveyor of the Aqueducts under Domitian, Nerva and Trajan.

The Acqua Appia. B. C. 312.

This was the first aqueduct made by the Roman to bring water into the city; it was executed in the days of the Censor Appius Claudius.

“The name of Appius has been handed down with more celebrity to posterity on account of his having made the road, called after him, the Appian, and for having conveyed water into the city, These works he performed alone: for his colleague had abdicated his office.” Livy, 9.29. “He brought water, which from him was called Appia, into Rome, from places four furlongs distant; and expended a vast sum of money on this work, received out of the treasury by consent of the Senate” Diodorus Siculus, 20,2. “It was repaired by Q. Marcus Rex, Praetor B. C. 144. Pliny, 36.24. «In the Consulship of M. Valerio Maximo and P. Decio Mure, thirty years after the Samnite war the Acqua Appia was brought into Rome by the Censor Appius Claudius Crassus, afterwards called Coecus or the blind.”

“The Appian stream rises in the fields of Lucullus 780 paces on the left hand side of the Via Praenestina between the 7th and 8th mile. The channel from its source to the Salinae, (salt stores) near the Porta Tregemina is 11 miles, 190 paces, it is all under ground except 60 paces which is carried on arches near to the Porta Capena.” (That is across the valley between the Coelian and Aventine Hills. It crossed the Via Appia over the Porta Capena; and sometimes the water dropped on the heads of the people. Hence Juvenal calls it, Sat. 3,11 “Moist Capena;” and Martial. 3,47, “The Capena gate drips with

large drops.") "It was joined at the old temple of Hope on the confines of the Torquatian and Pallantian gardens by a branch called the Augustine, because made by Augustus, whence it received the name of the twins (Gemelli.) » Frontinus, 1,5. The temple of Hope is the same as that mentioned by Livy, 2,51 and Lampridius, Heliogabalus, 13. Also by Dionysius, 9,24 who says it was 8 stadia or a mile from the city. From the Porta Esquilina, Arch of Gallienus, to the Porta Maggiore is just one mile, and on the right inside the gate the ruins of this temple of Spes were found by Canina, where is now the guard house.

The sources of this aqueduct are in some old stone quarries near Torre La Rustica off the Via Collatina, from these caves two springs are brought by separate channels to a common reservoir, thence to Rome. The old resperators can be traced across the Campagna for a long distance; and the springs are still serviceable but running to waste. These quarries are beyond those of Cervara and at an early date were used as tombs by the Collatians.

It entered Rome thorough the Aurelian wall to the right of the Porta Maggiore, and on the left of the base of the pier of the Marcia Tepula and Julia, hence it turned to the left underground to the arch of Dolobella. then to the left again, through the Villa Celiamontana and on to the arches, already mentioned, to the Aventine. It is traceable in the cave of the aqueducts under S. Sabba, to the reservoir under the church of S. Maria on the Aventine. From here there was a supply to the Emporium by the arch called Arco di S. Lazaro.

"The distribution of the Appian water begins at the foot of the Clivus Publicus at the Porta Trigenina" Frontinus, 1.5.

The Anio Vetus. B. C. 272-264

« Forty years after the Appian had been completed, in the year of Rome 481, Marcus

Curius Dentatus, who bore the office of Censor with Lucius Papirius Cursor, contracted to bring into the city the water of the Anio, which is now called the Anio Vetus, from the spoils taken from Pyrrhus. It takes its rise beyond Tivoli at the 20th milestone, giving some of its water to Tivoli. Its length in consequence of the difficulties of the levels is 43 miles, all underground except 221 on substructions. » Frontinus. 1. 6.

The sources are at the 20th mile from Tivoli on the left bank of the Anio below Subiaco; and several portions of the specus have been seen at different times, there are several reservoirs in the neighbourhood of Tivoli, it descends into the Campagna, making a great bend round the Villa of Hadrian and thence towards the Alban Hills, after skirting the base of these hills for some distance it turns towards Rome. All the aqueducts coming from the Sabine Hills made this great bend in order to avoid the many streams and valleys.

« About the 4th mile below the Via Nova (Now called Via Appia Nuova) the Anio Vetus crosses the Via Latina between the arches, towards the Via Labicana, and there it has a filtering place.» Frontinus 1,21. Its specus can be seen amidst the arches at the Torre Fiscale. « Thence just within the 2nd mile it gives part of its water into the specus called the Octavian,, which runs by the Via Nova to the Asinian Gardens, whence it is distributed through that neighbourhood. » Ib. That entered Rome by the Porta Asinaria and supplied the district of the Lateran. « But following the direct course of the specus it comes within (the city) at the Esquiline Gate and is dispersed through the city by high channels. » Ib. It was restored in B. C. 145 by Q. Marcius Rex, Pliny 36. 24,

« Because the increase of the population of the city seemed to demand a more ample supply

of water, instructions were given to Marcius by the senate that he should carefully examine how far there were other streams which he might be able to bring into the city. The former aqueducts he restored and introduced a third, which he built with squared stones and larger conduits for the public service. Frontinus l. 7. » The Appian and Anio Vetus were repaired by M. Agrippa in B. C. 44 » Frontinus l. 9.

Its specus was to be seen entering Rome at the left of the base of the pier of the Marcia Tepula and Julia, to the right of the Porta Maggiore; but it was blocked up in repairs made in 1872.

The Aqua Marcia. B. C. 145.

Pliny 31, 24, says. « The most celebrated water throughout the whole world, and the one to which our city gives the palm for coolness and salubrity, is that of the Marcian Spring, accorded to Rome among the other bounties of the gods: the name formerly given to the stream was the « Aufeian, » the spring itself being known as « Pitonia. » Which rises at the extremity of the mountains of the Peligni. passes through the territory of the Marsi and through Lake Fucinus and then, without deviating, makes directly for Rome: shortly after this, it loses itself in certain caverns. and only reappears in the territory of Tivoli, from which it is brought to the City by an arched aqueduct nine miles in length. Ancus Marcius, one of the Roman kings. was the first who thought of introducing this water into the City. At a later period, the works were repaired by Quintus Marcius Rex: and, more recently, in his praetorship, by M. Agrippa. »

In this passage, it will be noticed that, Pliny attributes the making of this aqueduct to the king Ancus Martius, but this is altogether a mistake, corrected by Pliny himself, 36,24,

where he says “ Q. Marcius Rex constructed, during his praetorship a new aqueduct, which bore his name, and was brought hither by a channel pierced through the sides of mountains.”

“It is reported that the Marcian water, which is drunk at Rome in preference to any other, has its source near lake Fucinus” Strabo, 5.3.13.

In order to celebrate this undertaking the Marcian Gens. under Q. Marcius Philippus, struck a denarius having on the obverse the name and head of Ancus Martius, the founder of the clan; and on the reverse an equestrian statue on the arches of an aqueduct, with the letters AQUAM, and on the margin of the coin the name Philippus.

“After (the building of the Anio Vetus) 127 years, in the year of the city 608, when Servius Sulpicius Galba and Aurelius Cotta were consuls, the conduits of the Appian and Anio being decayed by age, and fraudulently intercepted for private purposes; the repairing and reclaiming of the said aqueducts was entrusted to Marcius who was then Praetor. He introduced a third, which he caused to be built with squared stones and a larger channel, for the public service employing three thousand masons, hence it received the name Marcian from he who was the author of it.” Frontinus 1.7.

“The Aqua Marcia rises on the Via Valeria, turning off to the right at the 36th mile from Rome, three miles down the cross road to Subiaco (Via Sublacensis) which was first paved by Nero. At the 38th mile, 200 paces on the left, the water is like a pond, bubbling up in innumerable springs from beneath the stony hollows, and is very green in colour. Its length is 61 miles, 710 paces; of which 5 miles, 463 paces was above ground. 473 paces on arches in the upper valleys, 52 paces on a substruction from the 7th mile from Rome; and on an arcade to Rome for 6 miles, 472 paces. Frontinus, 1,7.
“Augustus supplemented it with another spring

600 paces beyond. which was called Aqua Augusta." Frontinus, 1.12. "It was repaired by M. Agrippa A. U. C, 719" Frontinus, 1.9. Augustus and Trajan also restored it, *Ib.* 93 125.

Caracalla A.D. 211-17 added another spring to this aqueduct. The principal source is 2 miles from Marano, 7 1/2 from Subiaco on the left of the Anio, called *Aque Serene*; the branch added by Augustus is near Agosta and called *Le Rosoline*; not far off is Caracalla's spring called La Fonte.

Tacitus A. 14, 22, tells us how Nero once polluted the Aque Serene. "Nero entered, for the purpose of swimming in the fountain head of the Marcian water, which is conveyed to the city. He was considered to have polluted the sacred water, and to have profaned the sanctity of the place by washing his person there; and a dangerous fit of illness which followed is fit no doubt of the displeasure of the Gods."

In the valleys beyond Tivoli remains of this aqueduct can be traced, and so on till it rises out of the ground at the farm of Roma Vecchia 6 miles from Rome, between here and the city traces of it are easily distinguishable. A fine view of the parallel arches of the Marcian and Claudian is to be had from the fourth mile on the Via Appia Nuova. At Torre Fiscale a pier with its specus remains; and at Porta Furba, there are several arches of it and a reservoir; so, and it can be traced to the pier in the Aurelian Wall, where it entered Rome; it is again to be seen at the Porta San Lorenzo, which was built in the repairs made by Augustus as inscribed upon the face of the arch.

From there it went to the Quirinal Hill as we learn from Martial who dwelt there.

"My dry house complains that it is not refreshed even by the slightest shower, although the Martian water bubbles close by." 9, 18.

From the Quirinal a branch crossed the then

narrow valley to the Capitoline Hill. Fontinus, 1.7

“At the Pallantian Gardens the Marcia throws off part of its waters, called the Herculanean, and passing through the Coelian hill ends above the Porta Capena; being of no use for the houses on the hill because of too low a level.” Frontinus, 19. The Marcian aqueduct was restored by Augustus, Monumentum Ancernium, also by Titus and Caracalla, Inscriptions.

The Aqua Marcia was again brought into Rome in 1870 by an Anglo-Roman Company. Some part of the ancient specus was used above Tivoli, but the greater part consists of new work. From Tivoli it is brought into Rome by two rows of iron pipes. It is now called Aqua Marcia-Pia, in honour of Pius IX; and enters the city at the Porta Pia 200ft above the sea, supplying the fountain in the garden in front of the Railway station and many of the houses in Rome.

The Aqua Tepula, B. C. 126.

“In the year of Rome 627, Plautius Hypsaus and Fluvius Flaccus being consuls, the censors Cneius Servilius Caepso, and Cassius Longinus brought into Rome and to the Citadel (Capitolium) the stream called the Tepula, from the fields of Lucullus in the district of Tusculum. The Tepula rises two miles to the right of the 10th milestone from Rome. Thence its stream was brought into the city.” Frontinus. 1, 8.

The source is at a spring now called Fontanaccio, under Grotta Ferrata. From there it was carried underground to the arches of the Marcian, hence it went on them to the Viminal hill in Rome; in many places the specus is observable above the Aqua Marcia,

The Aqua Julia, B. C. 34.

“Afterwards M. Agrippa, when aedile, after his first consulship. Caesar Augustus II. and

L. Volcatio Cos. In the year of Rome 719, collected the water of another spring at the 2nd mile on the right on a road off the Via Latina at the 12th mile, and so intercepted the water of the Tepula. To the newly acquired water the name Julia was given, from the finder of it; nevertheless the distribution was so divided as to retain the name of the Tepula."

The length of the Julia is 15 miles, 426 $\frac{1}{2}$ paces. At seven miles from the city it is carried for 528 paces on a substruction and on arches, for 6 miles, 472 paces.', Frontinus, 9,

"At the seventh mile on the Via Latina the Marcia, Tepula and Julia are taken into a covered filtering place, where, as though breathing again after their course, they deposit mud. Of these the Tepula, which had been intercepted and joined to the stream of the Julia, receives from the reservoir its proper quantity and flows out in its own channel, under its own name. The three are carried on the same arcade. The highest being the Julia, lower the Tepula then the Marcia. They enter the ground at the Viminal hill and run as far as the Porta Viminalis, where they again emerge. Part of the Julia is however taken at the Temple of Hope and distributed in the reservoirs of the Coelian Hill." Frontinus. 19.

The sources of the Julia are near the Ponte Squarciarelli, called Fontanile, on the road between Frascati and Marino. At the base of the Alban Hills after turning off the Frascati Road into the road to Grotta Ferrata, Via Latina, for about a mile, on the left hand side on a hill are some extensive remains of a great reservoir and filtering place of the Aqua Julia, whose specus can be traced to it, cropping up out of the ground; this is known as the Centroni. On the side of the roadway the united waters of the Craba and Almo streams flow through a tunnel of the Aqua Julia which is in a capital state of preservation. Between the 7th

mile and Rome various remains exist and at the right of the Porta Maggiore a pier of the Aqueducts with the three channels of the Marcia, Tepula and Julia is distinctly to be seen; also at the Porta S. Lorenzo; where the following inscriptions exist.

IMP. CAESAR. DIVI, IVLI. F. AVGVSTVS,
PONTIFEX, MAXIMVS, COS. XII.
TRIBVNIC. PO. ESTAT, XIX, IM. XIIII
RIVOS, AQVARIVM, OMNIVM. REFECIT.

IMP. CAES. M. AVRELIVS, ANTONIVS. PIVS.
FELIX. AVG. PARTH. MAXIM. BRIT.
MAXIMVS. PONTIFEX. MAXIMVS.

Aquem. Marciam, variis. Rasibus, Impeditam, Purgato, fonte, excisis, et. perforatis, Montibus, Restituta, forma, adquisito, etiam, fonte, novo, antoniano, in Sacram, urbera, suam perducendam, curavit.

IMP. TITVS. CAESAR, DIVI, F. VESPASIANVS
AVG. PONTIF. MAX. TRIBVNICIAE,
POTESTAT. IX. IMP. XV. CENS. COS. VII.
DESIG. VIII. RIVOM. AQUAE. MARCIAE.
VETUSTATE. DILAPSVM. REFECIT.

et. quam. quae. in v'sv'. esse desiderat reductis.

Also given in Gruter. CLXXVII. 1

The Aqua Virgo, B. C. 21.

“Agrippa repaired and augmented at his own charge the number of the aqueducts, which were so far decayed, that there was scarce any such thing as water in Rome. All this Agrippa did in his ædileship.” Dio Cassius in Augustus.

“Agrippa in his ædileship, united to the Marcian the Virgin Aqueduct, and repaired and strengthened the channels of others.” Pliny, 36, 24.

“When the people once complained to Au-

gustus of the dearness and scarcity of wine, he told them, 'My son-in-law Agrippa has sufficiently provided for quenching your thirst, by the great plenty of water, with which he has supplied the city.'" Suetonius, Augustus 32.

Pliny, 31. 25, gives the following account of this aqueduct.

"It was he, too, who brought the Virgin waters from the bye-road situated at the eighth milestone from the City, which runs for two miles along the Praenestina Way. Near these waters is the stream of Hercules, which the former shun, to all appearance, and have therefore obtained the name of "Virgin Waters." On instituting a comparison between the waters of these streams, the difference above-mentioned may be immediately detected, the Virgin water being as much cooler to the touch, as the Marcian water is in taste. And yet, for this long time past, the pleasure of drinking these waters has been lost to the City, owing to the ambition and avarice of certain persons who have turned them out of their course for the supply of their country-seats and of various places in the suburbs, to the great detriment of the public health."

Frontinus, 10, supplies the following details.

"M. Agrippa, after he had been consul for the third time in the consulship of C Sestius and Quintus Lucretius, that is 13 years after he had brought in the Julia, conducted to Rome the water which collects in the meadows of Lucullus. It is called the Virgin, because the spring was pointed out by a little girl. The Virgo rises in a marshy place at the 8th mile on the Via Collatia; a wall of (opus signinum) cement being placed round it, to retain the bubbling waters; which were increased by other springs. Its length is 14 miles and 105 paces; being subterranean for 12 miles, 845 paces; 540 paces on substructions: and 700 paces on

arches. The additional springs being underground 1 mile and 405 paces more."

"The Virgo has no filtering place. The arches of the Virgo commences at the Lucullan gardens in Rome and end at the Septa in the Campus Martius." *Ib.* 22.

This beautiful water bubbles up in a valley called Salone; close by is the mineral spring called by Pliny Rivus Herculaneus; and enters Rome under the French Academy on the Pincian hill after passing through the Catacombs of S. Priscilla. From the reservoir under the French Academy it passes to another reservoir at the top of the Vicolo del Bottino in the Piazza di Spagna thence towards the Trevi Fountain. At the rear of the houses on the left of the Via del Nazareno it rises on substructions; here there is a public washing fountain. In the court yard of a house in the Via Angelo Custodi on the wall of the aqueduct is the following inscription of some repairs made by Claudius in A. D. 46.

TI. CLAVDIVS. DRVSI. AVG. GERMAN.
PONT. MAX. TRIBVNIC. POT. V.
IMP. IX, P.P. COS. III. DESIG. IIII.
ARCVS. DVCTVS. AQVAE VIRGI. NIS.
DISTURBATUS. PER. C. CAESAREM. A.
FVN. DAMEMTIS. NOVOS. FECIT. AC.
RESTITVIT.

Also given in Gruter CLXXVI. 5.

It now terminates at the celebrated fountain of Trevi erected in 1736 by Benedict XIV, but originally it went on to the Septa and so supplied the Baths of Agrippa in the Campus Martius.

"Where the Hill of Mars is traversed by the Aqueduct of the Virgin" Ovid, *F.* 1. 41,5.

The same poet when in exile says, *Pont Ep.* 1,8,38.

"Now the grass of the plain that looks on the beautiful gardens, and the standing waters

of the Euripus; and the aqueduct of the Virgin recur to me.”

From the vicolo del Bottino a later branch passed down the Via Condotti, hence the name, to the Baths of Nero and Alexander Severus; it still supplies that neighbourhood and the fountains in the Circo Agonale, and Piazza Farnese; also the fountains on the Pincian Hill and Villa Borghese. Martial, Ep, 6.42 speaks of the clearness of the water.

“You many plunge into the Virgin or Marcian waters; which shine so brilliantly, and are so pure, that you would scarcely suspect any water to be there; and imagine that you saw nothing but the polished Lygdian marble.” This is the oldest of the Ancient aqueducts in use at the present day. In 1871 the piers of the Virgo were found in the Piazza di S. Ignazio, which church occupies part of the side of the Septa. In the Portico of the church of S. Maria in Cosmedin there is an inscription from the house of Pope Hadrian I, (772-95) one of the Colonna popes, which was in the Via Lata and in low relief are the arches of the Aqua Virgo which ended near his house.

The Aqua Alsentina-Augusta. A.D. 10.

“It begins at the Alsentine lake (Martignano) on the Via Claudia, turning off at the 24th mile, 6 miles and a half on the right. Its length is 22 miles, 172 paces underground and on arches 358 paces. It is the lowest in level supplying only the Transtiberine quarter. What could have induced Augustus, that most careful of Emperors, to bring in the waters of the Alsentina, which is also called Augusta, I do not know; for it is not pleasant to the taste and therefore no use to the people. It may of be, however, that when the work of his Naumachia approached completion, in order not to divert the more wholesome water, he introduced

this for the special purpose, and gave the surplus to the adjacent gardens." Frontinus, 11.

"Near Carciae it receives water from the Sabatine lake (Bracciano) also, as the Aquarii regulate. It yields 392 quinarial." Frontinus, 72.

The sources of this aqueduct are on the banks of the lakes Martignano and Bracciano on the western side of Rome, its *specus* can be traced by means of the respirators and was partly used by Paul V when he brought in Trajan's Aqueduct. It supplied the great Naumachia excavated by Augustus for the representation of Naval fights, 1800ft long and 1200 broad. This was at the grove of Cæsar; about a mile outside the Porta Portuensis. (Mon Ancyri) "The grove which was planted by Augustus round the lake where the naval combat was exhibited" Tacitus A. 14. 15. "Augustus exhibited a Naval fight on the far side of the Tiber in an artificial lake." Ib 32. 56.

This Naumachia is spoken of by several of the classic writers.

The Aqua Augusta, A. D. 10.

This was an underground aqueduct made by Augustus, as an addition to the Aqua Appia, and brought from near the source of the Appia, in the meadows of Lucullus. It has an independent *specus* to Rome as far as the Porta Maggiore, whence it flows into the *specus* of the Appia.

"It had its source at the 6th mile on the Via Prænestina, about 980 paces off to the left, near the Via Collatina. Its length was 6 miles 333 paces." "At the old temple of Hope on the confines of the Torquatian and Pallantian gardens it was united to the Appia, hence they received the name *Gemelli* or the twins." Frontinus, 5.

The Aqua Claudia A. D. 50.

"The preceding Aqueducts, however, have

all been surpassed by the costly work which was more recently commenced by the Emperor Caius, (Caligula) and completed by Claudius. Under these princes, the Curtian and Caerulean springs, with the New Anio were brought from a distance of 40 miles, and at so high a level that all the hills were supplied with water, on which the city is built. The sum expended on these works was three hundred and fifty millions of sesterces." Pliny, 36, 24. The Sester-tius was then of the value of $1\frac{3}{4}$ d. So that the sum would be 2,552,083, 6, 6. Pounds.

"Caligula began, likewise, the aqueduct from the neighbourhood of Tivoli which was completed by his successor Claudius." Suetonius, Caligula 21.

"Claudius completed an aqueduct which had been begun by Caius. He brought to the city the cool and plentiful springs of the Claudian water, one of which is called Caeruleus, and the others Curtius and Albulinus; as likewise the stream of the New Anio, in stone and brick channels and distributed them into many magnificent reservoirs." Suetonius, Claudius; 20.

"The waters that rise in the Simbruine hills were conveyed by Claudius to Rome." Tacitus, A. II, 13.

"Caius Cæsar, who succeeded Tiberius, considered seven aqueducts scarcely sufficient for public purposes and private amusements, began two new aqueducts in the second year of his reign, Aquilius Julianus and P. Nonius Asprenas being consuls in the year of Rome 791. (A. D. 38) which work Claudius a most splendid manner finished and dedicated on the kalends of August in the year 803 (A. D. 50) when Sulla and Titianus were consuls. The name Claudia was given to the one of the springs Cæruleus and Curtius, which is next in order of excellence to the Marcian." Frontinus 13.

"The Claudia begins on the Via Sublacenis, at

the 38th mile, 300 paces to the left of the road. There are two very large and beautiful springs, one called Cæruleus, from its blue appearance, the other Curtius. It also received a spring called Albulinus, of such excellence that when it is added to the Marcian the latter loses none of its quality. The spring Augusta was turned into the Claudian because the Marcian was sufficient for itself, nevertheless it could be used for either channel.

The channel of the Claudian is 46 miles 406 paces long. 10 miles, 176 paces above ground of which 3 miles, 76 paces is in the upper valleys; and at the 7th mile from Rome 609 paces are on substructions, and on arches 6 miles, 491 paces." Frontinus 14.

The sources are at a lake called S. Lucia just beyond Subiaco, the Via Sublacensis turning off from the Via Valeria beyond Mandela, several picturesque arches remain in the Valley, beyond Tivoli; and in the Campagna at S. Antonio and Ponte Lupo; but it is not till the 7th mile from Rome that the arches are continuous. There it rises out of the ground in that grand stretch of stone Arches with which visitors to Rome are so familiar, and which can be followed right up to the city. Many of the arches, filled up or strengthened with the brick arches of Hadrian, who executed extensive repairs, exist, but a considerable portion was destroyed and used as building material when Sextius V built his aqueduct. For some miles it continues and the next object of interest is the tall Tor Fiscale, a mediaeval tower built at a point where seven Aqueducts crossed, the channels of these can be distinctly seen. The Anio Vetus on the ground, crossed by the Felice, Marcia, Tepula and Julia, these recrossed by the Claudia and Anio Novus. Near to Rome the Claudian arches were filled up by Annelian and made to do duty as the wall

of the city, here it is best seen in the gardens of St. Croce; it here turns and crosses the Porta Maggiore, at its bend being tapped by Nero's Aqueduct. It then crossed at a point where the Via Praenestina diverged from the Labicana; and Claudius who was obliged to convey the two new streams of the Acqua Claudia and the Anio Novus over these roads, erected for this purpose upon the city boundaries a massive gateway, in the rustic style, which spanned both roads at once with a double arch. This is the splendid monument afterwards taken into the Aurelian wall, and converted by the erection, of a mound in front, into a kind of bulwark, in the time of Honorius and Arcadius. It now forms one of the city gates, under the name of the Porta Maggiore.

The first inscription on the Aqueduct of Claudius mentions the streams conveyed into the city, by the Emperor, upon these arches. From it we learn that the water in the channel which bore his name was taken from two sources, the Caeruleus and Curtius, forty-five miles off; and that the Anio Novus, which flows above the Acqua Claudia, was brought hither from a distance of sixty-two miles.

The second inscription relates to the restorations of Vespasian. The third to those of Titus.

TI. CLAVDIVS. DRVSI. F. CAESAR.
 AVGVSTVS. GERMANICVS. PONTIF. MAXIMI
 TRIBVNICIA. POTESTATE. XII. COS V.
 IMPERATOR XXVII. PATER. PATRIAE.
 ACQVAS. CLAVDIAM. EX. FONTIBVS. QVI.
 VOCABANTVR. CAERVLEVS. ET. CVRTIVS.
 A. MILLIARIO XXXXV. ITEM. ANIENEM.
 NOVAM, A MILLIARIO. LXII. SVA. IMPENSA
 IN. VRBEM. PERDVCENDAS, CVRAVIT.
 IMP. CAESAR. VESPASIANVS. AVGVST.
 PONTIF. MAX. TRIB. POT. II. IMP. VI COS. III.
 DESIG. IIII. P. P. AQVAS. CVRTIAM. ET.
 CAERVLEAM. PERDVCTAS A DIVO CLAVDIO

ET POSTEA. INTERMISSAS, DILAPSAQVE.
PER. ANNOS. NOVEM. SVA IMPENSA. VRBI
RESTITVIT.

IMP. T. CAESAR. DIVI. F. VESPASIANVS.
AVGTSTVS. PONTIFEX. MAXIMVS, TRIBENIC
POTESTATE X IMPERATOR XVII PATER,
PATRIAE. CENSOR COS. VIII. AQVAS.
CVRTIAM. ET CAERVLEAM. PERDVCTAS.
A. DIVO. CLAVDIO. ET POSTEA. A DIVO.
VESPASIANO. PATRE. SVO. VRBI.
RESTITVTAS. CVM. ACAPITE. AQVARVM.
A. SOLO. VETVSTATE DILAPSAE ESSENT.
NOVA FORMA REDVCENDAS. SVA IMPENSA
CVRAVIT.

Also given Gruter CLXVII.

The Aqua Anio Novus A. D. 52

This aqueduct, as we have seen, was made about the same time as the Claudia, and as it followed the same route to the city it is difficult to separate the account of them.

Frontinus, 15, says "At the 32nd mile on the Simbruine hills, the Anio Novus is taken out of the River Anio, which is muddy and turbid, therefore at the beginning there is a filtering place, so that the water on its way from the river to the specus may become settled and clear. From this cause, after heavy rains, the water flows into the city in a turbid state. There it is joined by (another) Rivus Herculaneus which rises on the same road at the 30th mile, on the other side of the river and road to the Claudian. This is very pure by nature, which when mixed is lost.

"The Anio Novus is 58 miles, 700 paces in length; 49 miles, 300 paces being underground; 2 miles 300 paces on arches and substructions in the upper country, and at the 7th mile from the city 609 paces on substructions, 6 miles and 49 paces on arches, elevated in some places, 109 feet." Frontinus 15.

“Because two streams of the Anio flowed into the city, the former was called Anio Vetus and the new one Anio Novus. It ruins all the others.” Ib 13. On account of its muddy water.

The sources are three and a half miles under Subiaco at place called Muraccio, when it reaches the Claudia it is carried above that to Rome, the brick specus being easily distinguished above the stone arches and channel of the Claudian.

“The Anio Novus and Claudia are carried from the filtering place upon higher arches, so that the Anio is the highest of the two. Their arches come to an end at the Pallautian Gardens, and thence for the use of the city they are carried down in pipes.” Frontinus, 20.

“Nerva to get rid of the bad qualities of the Anio Novus change its source and took its water from a lake above Nero’s Simbruine Villa” Ib, 90.

“The water of the Anio Novus often spoilt the rest, for since it was the highest as to level, and held the first rank as to abundance, it was most often made use of to help the others when they failed. The stupidity, indeed, of the Aquarii was such that they introduced this water into the channels of several others where there was no need, and spoilt water which flowing in abundance without it. This was the case especially as regards the Claudia, which came all the way for many miles in its own channel perfectly pure, but when it reached Rome, and was mixed with the Anio, lost all its purity. And thus it happened that most of the streams were not in fact helped at all by the addition of the extra water, through the want of care on the part of those who distributed it.” Frontinus, 91.

The following is the height of the levels, above the sea, of the bottom of the channels of the aqueducts at the Porta Maggiore.

APPIA	121 feet.	
ANNIO VETUS	149 »	<i>St Maria</i>
MARCIA	173 »	<i>Maggiore, the</i>
TEPULA	182 »	<i>highest point</i>
JULIA	191 »	<i>on the Esquiline</i>
CLAUDIA	203 »	<i>is 187 1/2 feet</i>
ANIO NOVUS	212 »	<i>above the sea.</i>

The Neronian Arches.

These beautiful brick arches were erected by Nero to carry the specus of the Aqua Claudia from the Porta Esquilina, where it entered Rome, to the Cœlian hill. *Frontinus* 76 says 'the emperor Nero raised the Aqua Claudia to a great height on the series of arches extending to the temple of Claudius.' and at c 30 "But first of all the Claudia transfers a part of its waters on to the arches which are called the Neronian at the old temple of Spes, These, being continued in a direct line along the Mons Coelius, are terminated close to the temple of Claudius."

These arches still exist nearly all the length of the way from the Porta Maggiore to the church of Sts John and Paul on the Cœlian, part being in double arcades. the most picturesque portion is in the Villa Valkonski. The construction is the best in the world consisting of eight bricks to a foot and for the arch work nine .

"In the time of Nerva (A. D. 97) the Marcian having been enlarged it was carried from the Cœlian across to the Aventine" *Fontinus*, 2. 87.

A Coin of Nero, represents that hero seated on the right before whom is a figure presenting a tablet to Roma. Behind are a male and female figure, looking like statues; and in the back ground is an arcade of five arches. Round the coin is the Legend CONG. II. DAT. POP. Congiarium Secundum Datum Populo. The

second present given to the people. The first being The Bath and Gymnasium. Suetonius Nero 12.

“By Nero’s arches the water of the Claudian was dispersed through Mons Cœlius, the Palatine, the Aventine and Trastevere.” Frontinus, 20. In the Villa Cœlimontana there is a large reservoir which was supplied by the Aqua Appia and the Claudian-Neronian; from it there are three branches, one going to the Nymphaeum on the Cœlian, opposite the Colosseum, one to the Palatine, and the third to the Aventine, following the road-way towards S. Gregory, there is a fine piece in a garden adjoining the three chapels, here was a bend on its way to the Baths of Sura on the Aventine, where a large reservoir and some arches exist overlooking the Valley of Circus Maximus. Of some of these Aqueducts described by Frontinus, we have their respective heights given by him, c 18. he says, “The Anio Novus was the highest, next the Claudia, the third was the Julia, fourth the Tepula, then the Marcia.”

Of the vast Nymphaeum or Reservoir of Nero on the Cœlian considerable remains exist, showing that it must have been the most extensive and handsomest fountain in the world. A fragment of the Marble plan represents part of it and the line of the supplying aqueduct. A wall fifty feet high, broken with niches and hemicicles, cased with rare and precious marbles and decorated with statues formed the background; over and through which poured and rushed streams of water falling into a basin at the foot of the wall; and then flowing in one long cascade of ten feet fall into a lower basin, hence it ran in a stream into the great artificial lake, where now stands the Colosseum, “like unto a sea,” Suetonius, Nero, 31.

The arches of Nero were continued by Vespasian who carried the channel on a row of

double arches across the valley between the Cœlian and Palatine hills, where a fine portion of them still exists.

From these arches in the centre of the valley a branch ran parallel to the Via Triumphalis, the spring of the branching arch is distinguishable at the pier close to the road, supplying the Meta Sudans fountain and other places in that vicinity.

Aqua Traiana-Severiana a. d. 109, 200

Trajan commenced to bring in water from some springs close by Lake Bracciano or Sabatinus, on the further side from Rome. Passing in an underground channel round the lake towards the posting station of La Storta, two miles before reaching which it crosses a valley on an arcade, from La Storta it made another bend over Monte Mario to the Janiculum where it rose on arches for about a mile; the construction of these arches is reticulated work of the time of Hadrian, showing that he finished what Trajan had commenced at his own expense, as we are informed by the following inscription found at La Storta in 1830.

IMP. CAESAR. DIVI.
NERVAE. F. NERVA.
TRAIANVS. AVG.
GERM. DACICVS.
PONT. MAX. TR. POT. XIII.
IMP. VI COS. V. P. P.
AQVAM. TRAIANAM.
PECVNIA. SVA.
IN. VRBEM. PERDVXIT.
EMPTIS. LOCIS.
PER. LATITVD. P. XXX.

After rising out of the ground near the Villa Doria it divides, one stream going to the Vatican and fountains in front of St. Peter's and the main stream to the large fountain on the Janiculum; which was rebuilt by Paul V,

who restored this aqueduct, in 1540 and which still supplies the Trastevere quarter. Procopius, de B.C. 1,19, speaks of the old fountain being destroyed by the Goths. This is now called the Aqua Paolo: it supplied the curious fountain on this side of the Tiber at the Ponte Sisto, and which has been removed in the embanking works to be re-erected at another site. A coin of Trajan's commemorates his extensive works and repairs to this aqueduct. Beneath an arch is a reclining figure, representing the genius of the stream, under which is the inscription Aqua Trajana. S.C. whilst round the coin is the legend, S.P.Q.R. Optimo Principi.

There is a fine relief, representing the dedication of this aqueduct, on the arch of Constantine. It is the left hand relief on the Via Triumphalis front. In the fore-ground is the celebrated Greek artist Appollidorus with his assistants approaching the Emperor and his attendants, whilst in the back-ground are the arches of the aqueduct and the standards of the city cohorts. This relief is one of those stolen from Trajan's arch.

**Aqua Hadriana-Alexandriana-Felice,
117-138-226-1585.**

Frontinus, the great guide for the Aqueducts died in the reign of Trajan (106) and we now miss his valuable aid; the later authors not saying much about the aqueducts; but from the slight notices and tracing the remains we are enabled to give the following particulars.

“Hadrian made an an aqueduct which was called after him” Spartianus, Hadrian 20. This was to supply his villa at Cento Celle 5 miles from Rome; from there it was brought into Rome. From the petrifying nature of the water the specus was soon blocked up with Stalactile; and so Alexander Severus took another spring, close by, and building a new specus on the

top of the old arcade brought it into Rome.

From the extensive repairs and additions made by Alexander Severus it was named after him. "Lampridius A. Severus, 25.

Its sources are three miles from Gabii under La Colonna the ancient Labicum, where the following inscription was found in 1798.

IMP. CAESAR. DIVI. TRAIANI.
PATHICI. FILIVS. TRAIANUS. HADRIANUS.
AVG. PONTIFEX. MAXIMVS
AQVE DVCTVM GABINIS QVAM.

It runs between the Via Gabina-Praenestina and Via Labicana on brick arches, of which there are considerable remains, to Cento Celle sometimes the arcade is double. From the so called Mausoleum of S. Helena it can be traced to some fine arches, spanning a valley, and going towards the Claudian arches, nearly at Porta Furba, it here turned to the right and running by the side of the older arcades entered Rome near the Porta S. Lorenzo, inside which gate are some lofty brick arches, in front of the Church of S. Bibiana, which carried the water to the Nymphaeum of Alexander Severus, near the church of S. Eusebio, in the Piazza Vittorio Emanuele.

In the city many of the large reservoirs were also ornamental fountains, such as the Trevi fountain of the present day, they were named nymphaea from the old idea that the nymphs lived at the springs; and they were decorated with female statues. One of the most extensive and picturesque of these Nymphaea is the Nymphaeum of Alexander Severus on the Esquiline and which was to the old city what the Trevi and Paolo fountains are to the modern city. The water entered at the rear; the piers of the aqueduct, having been traced right up to it, from the reservoir it poured out through many openings into a large basin, hence it flowed away. The edifice was decorated with

marbles and statues; and is represented on a bronze coin of the emperor. On the obverse is the Head of the Emperor with the legend Imp. Caes. N. Aur. Sev. Alexander. Aug. whilst on the reverse is P. M. Tr. P. V. Cos. II. P. P. S. C. for Pontifex. Maximus. Tribunitiae. Potestate. Quinque. Consul II. Pater Patriae. Senatus Consulto. A. D. 226.

In the foreground is a basin, a wall at the rear has alternate round and square headed niches five in number, out of which poured the water; this supports the upper story decorated with columns and three niches. In the centre niche are statues of Alexander Severus and his wife Orbiana and in the side niches are military trophies. These are the trophies now in the balustrade of the Capitol. They were originally dedicated to Trajan by the British and Gallic legions and decorated part of Trajan's Forum; and were translated from there to this nymphaeum when it was erected; from here they were taken to the Capitol in 1535. During the Middle ages and till very lately they were miscalled the Trophies of Marius. Above the niches are reliefs; the whole being surmounted by a quadriga and trophies. On the left there seems to be a column surmounted by a Victory. Right and left of the basin are two wings with niches, one over the other, from which issued the water. The roofs of these wings slope inwards and are surmounted with statues.

The following inscription was found here

HERCVLI. CONSERVATORI.
INVICTO. COMITI.
D. N. SEVERI. ALEXANDRI.
PII. VICTORIS. SEMPER
AVC. AC OPTIMI. PRINCIPIS.
M. AVRELIVS. PRISCILLIANVS
V. C. CVRATOR. NYMPHAEI.
DEVOT. NVM. M. Q. E.

The spring of the Aqua Alexandrina is 15 miles from Rome; and the aqueduct is very direct in its course.

This water was again brought into Rome by Pope Sixtus V, 1585-90, and is called from him the Aqua Felice.

The sources are twelve miles from Rome and it terminates at the fountain of Moses in the Piazza S. Bernardo on the Quirinal Hill. It is underground as far as the Farm of Roma Vecchia about 6 miles from Rome and then it comes in on arches to the Porta Maggiore. Sixtus destroyed the arches of the Marcian and Claudian for the material, and his aqueduct often runs through the piers of the older ones. It is 15 miles underground and 6 on arches. It supplies many fountains in the oldest part of present Rome, the most interesting of which are the Triton fountain in the Piazza Barberini, the fountain in the Piazza Monte Cavallo, The Tartarughe fountain; and Triton fountain opposite the Round temple of Hercules.

Aqua Aurelia, A. D. 162

This was erected by Marcus Aurelius as we learn from the brick stamps found in the Aqueduct. EX. FIG... AEAM.. AVGVS. RUST.. II, ET. AQVI... Junius Rusticus and Aquilinus were consuls in 162. Its sources are not far from those of the Tepula and Julia, and a fine piece of the brick arcade may be seen half way on the road to Albano, running towards the Villa of the Quintilli on the Via Appia, which it supplied, it passed on to the Villa Herodes Atticus, and so on it entered Rome near the Porta Latina and supplied the Baths of Commodus close by, being underground nearly all the way. One of the most impressive ruins on the Palatine Hill is the grand Nymphaeum built by this Emperor as related by Marcellinus, 15, 8, 3. "The Emperor Marcus built the Nymph-

haeum, an edifice of great magnificence, near the well-known Septemzodium." Rows of beautifully constructed lofty brick arches supported an immense reservoir from the sides and one end of which the water poured through adequate openings into an extensive basin at the base of the piers of the arches; the whole being highly decorated with works of art. Now, the reservoir is a favourite promenade from which one of the most extensive and enchanting views of the Roman Campagna looking southwards, may be enjoyed.

Aqua Severiana A. D. 200.

This was an aqueduct made to supply the Baths of Septimus Severus, which were in Trastevere, at his gate, as we learn from Spartianus, Severus 19. These baths would be in the neighbourhood of the Porta Settimiana. We know nothing of a separate aqueduct by him on the right side of the Tiber without he added to the Alseatina, as Trajan did, and brought in the water of Lacus Cimini, now Lago Vico, beyond Bracciano. « Cimini cum monte lacum lucosque Capenos. »

Virggl Æ vii, 702.

Aqua Antoniana, A. D. 215.

This was a branch, made by Caracalla to supply his baths with water, from the Marcian, it crosses the Via Appia Nuova at the second mile and can be traced along the line of the Via Latina up to the Gate, where it entered and crossed the Via Appia on the Arch of Drusus to the Therme of Caracalla. Just by the railway bridge outside the Porta Latina there is part of the brickwork leading to a large reservoir, erected against the side of a hill and very noticeable in going up the hill on the Via Appia, at the Domine quo vadis.

Aqua Sabina Augusta, A. D. 130.

This water was so called from the wife of Hadrian, Sabina Augusta, and was the last of the ancient work to supply Rome with water. Its sources are at Pentima Stalla in the woods to the east of the so called Campo di Annibale near Rocca di Papa where the following inscription was discovered in 1873,

AQUA AUG
PUT P
CIP XVII

This was a cippus marking the line of the aqueduct, similar ones have since been found.

It was made originally to supply the city of Tusculum with water and a large reservoir and filtering place of the time of Hadrian is still to be seen there. Later on it was collected in a lower reservoir which is also very extensive and of the construction of Hadrian; from there it was taken down to supply some of the numerous villas on the Campagna notably that known as the Villa of Septimius Bassus, the construction of which is Hadrian's period. About the year 300 Diocletian brought it into Rome to supply his Baths and later Constantine used it for his baths on the Quirinal.

In the same woods of Rocca di Papa, on the left going up there is a fine brick aqueduct of ten arches spanning a deep ravine of the Aqua Crabra stream, this is second century brick work, part of the scheme of Hadrian. At the present day Frascati is supplied with water from this source. Numerous reservoirs exist between Rome and Tusculum which we may look upon as belonging to the Aqua Augusta, for they certainly do not belong to any of the aqueducts we have mentioned. As no traces of arches exist below the hills we may conclude that this aqueduct was subterranean. The course was about 15 miles long.

FOURTH CENTURY AUTHORITIES.

The *Curiosum* and *De Regionibus*, fourth century *Regioni Catalogues*, enumerate seventeen aqueducts, which we may presume were existing in their day, as follows; and which we have described above.

- | | |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11 Traiana. | This was made by Trajan in A. D. 109. |
| 12 Annia. | Intended for the <i>Annio Novus</i> A. D. 52. |
| 2 Attica. | The Ancient Anio, <i>Anio Vetus</i> B. C. 272. |
| 3 Marcia. | Made by <i>Marcus Rex</i> , B. C. 145. |
| 9 Claudia. | Commenced by <i>Caius</i> , finished by <i>Claudius</i> A. D. 50. |
| 3 Herculea. | A branch of the <i>Marcia</i> in Rome. Also a spring of the <i>Anio Novus</i> . |
| 9 Cerulea. | Mentioned separately by the <i>Curiosum</i> only. A spring of the <i>Claudian</i> . |
| 5 Julia. | Made by <i>Agrippa</i> B. C. 34. |
| 8 Augusta. | Made by <i>Augustus</i> . A. D. 10
Also a spring of the <i>Marcia</i> . |
| 1 Appia. | Made by <i>Appius Claudius</i> B. C. 312. |
| 7 Alseatina. | Made by <i>Augustus</i> . A. D. 10. |
| 16 Setina. | Mentioned only by the <i>De Regionibus</i> , evidently a corruption of <i>Sabina - Augusta</i> . |
| 14 Ciminia. | We know of no aqueduct so called. <i>Lake Cimini</i> now called <i>Largo Vico</i> is beyond <i>lake Bracciano</i> . Probably the source of the <i>Severiana</i> . |
| 13 Aurelia. | Made by <i>Marcus Aruilius</i> A. D. 162. |
| 12 Damnato. | The Aqueduct made by Ha- |

- drian A. D. 130, and condensed on account of the lime blocking the specus.
- 6 Virgo. Made by Agrippa B. C. 21.
 4 Tepula. Made by Claudius A. D. 52.
 14 Severiana. Made by Septimius Severus A. D. 200.
 15 Antoniniana. Made by Caracalla A. D. 215.
 17 Alexandrina. Made by Alexander Severus on the arches of Hadrian A. D. 226.

The numbers give the order in which they were made.

CHRONOLOGICAL LIST.

The following is a list of the Aqueducts in chronological order, and their lengths.

Appia	11 miles	190 paces
Anio Vetus	43 "	
Marcia	61 "	710 "
Herculea branch	3 "	
Tepula	13 "	
Julia	15 "	425 "
Virgo	14 "	150 "
Augusta	6 "	335 "
Alsietina	22 "	530 "
Claudia	46 "	400 "
Anio Novus	58 "	700 "
Neronian branch	2 "	320 "
Traiana	42 "	
Hadriana	15 "	200 "
Aurelia	16 "	
Severiana	10 "	500 "
Antoniniana branch	3 "	400 "
Sabina - Augusta	15 "	350 "
Alexandrina	15 "	300 "

That is 415 1/2 Roman Miles, or miles of 1,618 English yards which equals 381 English miles, 165 yards.

Of this 4 miles, 81 paces was composed of substructions; and 30 miles, 554 paces on arches. Truly a stupendous work!

SUPPLY.

The supply of water was properly measured both within and without the city for private and public use; and it has been calculated that altogether the supply was 332,306,624 gallons daily; which would be over 332 gallons for the daily use of each individual, if we estimate the population at one million; and there is no authority whatever for computing it at more. The waters of many of these aqueducts were interchangeable within the city, so that if the supply of one was stopped for repairs etc, the water of another could be turned through its pipes.

Notwithstanding that some of these aqueducts were damaged in the wars of the 6th and 7th century, the supply did not entirely cease till the 14th when Rome was abandoned by the papal court; and in the present day four of the ancient sources supply the city with water, such a supply as no other city in the world can boast.

It is calculated that the four Aqueducts in use supply Rome with the following amount of water, daily.

Vergine	155.	271	Cubie	Metres.
Felice	21.	638	"	"
Paola	80.	871	"	"
Pia - Marcia	150.	000	"	"

407. 780

or roughly, twelve million cubic feet, nearly 300 gallons daily for each individual.

Professor Mauro and Doctors Piccioni and Nasini, acting under government instructions, have recently completed a thorough and exhaustive analyses of the four waters now supplying Rome; and their work under the editorship of Professor Cannizzaro is highly interesting. The pureness of the water may be seen from the following table taken from their work; it indicates in grammes the components contained in 100 litres of the waters, when evaporated it leaves a residue of less than 50 grammes to the 100 litres; which is considered by the best authorities as very pure.

Per 100,000 parts of water.	Value: Limits	Vergine.	Felice	Paola.	Marcia
Oxide of calcium, CaO	11-12	8.52	13.72	3.91	11.0
Oxide of magnesium MgO	4.0	1.87	2.77	1.88	3.278
Anhydrous sulphuric acid. SO ₃ ...	2-6.3	1.702	2.036	2.09	0.264
Chlorine, Cl	0.2-0.8	1.283	1.001	3.728	0.39
Anhydrous nitric acid, N ₂ O ₅	0-4	0.826	0.616	0.233	0.278
Anhydrous nitrous acid, N ₂ O ₃	0-trace	Traces	Infinite traces	0	0
Ammonia	0-trace	0	0	Infinite traces	0
Total residue dried at 180	10-50	36.92	43.84	27.80	28.60
Total hardness expressed in French degrees	28-32	18.33	29.36	11.80	27.52
Quantity of oxygen consumed (Tidy's method), 3rd hour	0.05 0.25	0.0096	0.0064	0.0104	0.0032



PHOTOGRAPHS.

The following photographs illustrate our description of the aqueducts, and their fountains in Rome; and will enable our readers to form some idea of the most extensive and useful work ever undertaken by any people for the use and ornamentation of their capital.

We shall be happy to supply the set of twentyeight photos on receipt of ten lire, two dollars or eight shillings

The Via Appia Nuova and the arches of the Marcia, Tepula and Julia; the Claudian and Anio Novus with the Felice.

Reservoir of the Marcian at the Porta Furba, with the specus of the Claudian showing through the arch of the Marcian.

Marcian Fountain in front of the railway station.

The Porta Tiburtina, S. Lorenzo, showing the Marcia, Tepula and Julia.

The Aqua Virgo fountain of Trevi.

Fountain in the Circo Agonale.

Fountain of Moses in the Pincio Gardens.

Villa Borghese fountain.

Relief of the Arches of the Aqua Virgo with inscription of Pope Hadrian I. 775

Arcade showing the Claudian Specus.

The Claudian Aqueduct from the bed of the Almo, Via Appia Nuova.

The Porta Maggiore with the channels and inscriptions.

Arcade showing the specus of the Anio Novus, above the Claudian.

Arch of Dobabella on the Coelian supporting the arch of Nero.

Reservoir of Nero from the marble Plan.

Arches of Vespasian crossing the valley between the Coelian and Palatine.

Ruins of the Meta Sudans fountain.
The Meta Sudans from a coin of Titus.
Fountains at St. Peter's.
Aqua Paola fountain.
Nymphaeum of Alëxander Severus from a coin.
Fountain of Moses.
Triton fountain Piazza Barberini.
Tartarughe, tortoise, fountain.
Fountain of the Bocca della Verità, opposite
the round temple of Hercules.
Nymphaeum of Marcus Aurelius, arches
Nymphaeum of Marcus Aurelius, upper part.
Aqueduct of Caracalla crossing the Via Appia
on the Arch of Drusus.



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